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TITLE: Organic solid state switches incorporating porphyrin compounds and method for producing organic solid state optical switches

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INVENTOR-INFORMATION:

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CLAIMS:

The embodiment of the invention in which an exclusive property or privilege is claimed is defined as follows:

1. A light intensity-dependent molecular switch comprising:
an aromatic diimide having a first end and a second end, said ends terminating with identical chemical structures;
a first electron donor selected from the group consisting of porphyrin and substituted porphyrin, said first electron donor covalently attached to the first end of the diimide so to facilitate reversible electron transfer between the first electron donor and the diimide when light of a first predetermined wavelength strikes the first electron donor, thereby creating a first excited state; and
anthracene covalently attached to the second end of the diimide so as to facilitate reversible electron transfer between the anthracene and the diimide when light of a second predetermined wavelength strikes the anthracene, thereby creating a second excited state.
2. The invention as recited in claim 1 wherein the substituted porphyrin is metallated with metals selected from the group consisting of Zn, Mg, and combinations thereof.
3. The invention as recited in claim 1 wherein the substituted porphyrin is substituted with alkyl groups ranging in carbon length from approximately 5 carbons to 15 carbons.
4. The invention as recited in claim 1 wherein the aromatic diimide is selected from the group consisting of N,N'-diphenyl-3,4,9,10-perylene (dicarboximide), 1,4,5,8-naphthalene diimide, 1,2,4,5-benzene diimide, 2,3,6,7-naphthalenediimide, and combinations thereof.
5. The invention as recited in claim 1 wherein the first predetermined light wavelength and the second predetermined light wavelength are selected from the range of between approximately 400 nm and 800 nm.
6. A light intensity-dependent molecular switch consisting of:
N,N'-diphenyl-3,4,9,10-perylenebis (dicarboximide) as an electron acceptor moiety;
a porphyrin molecule as a first electron donor moiety and a porphyrin molecule as a second electron donor moiety, both covalently attached to the electron

acceptor moiety, so to facilitate reversible electron transfer between the first and second electron donor moieties and the electron acceptor moiety when light having a first predetermined wavelength strikes the first electron donor moiety, thereby creating a first excited state and when light of a second predetermined wavelength strikes the second electron donor moiety thereby creating a second excited state.

7. The invention as recited in claim 6 wherein the porphyrin molecule is metallated with a metal selected from the group consisting of Zn, Mg, and combinations thereof.

8. The invention as recited in claim 6 wherein the first predetermined light wavelength is 713 nm and the second predetermined light wavelength is 546 nm.

9. The invention as recited in claim 6 wherein the porphyrin molecule is substituted with a plurality of alkyl groups ranging in carbon chain length from 5 to 15 carbons.